REMARKS

Reexamination and reconsideration of the rejections are hereby requested.

Claims 1-13 are pending in this application and all of the claims stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Law, U.S. patent number 3,173,814.

The present invention is a method for making an epitaxial germanium temperature sensor. As discussed in the specification, prior art techniques for producing temperature sensors via doping crystals are problematic for temperature sensors capable of performing at very low temperatures such as below about 4K. For example, although both silicon and germanium can be melt-doped, operating temperatures below 1K can lead to fluctuations of a few percent in the dopant concentration and fluctuations in resistivity by more than an order of magnitude. According to the present invention, an epitaxial germanium temperature sensor is made using a chemical vapor deposition process to deposit an epitaxial germanium layer onto a substrate. Importantly, the epitaxial germanium layer is doped during the vapor phase of the CVD process to allow the layer to be resistive. Doping concentration is selected so that at temperatures below about 4K, resistivity of the layer is due to the mechanism of hopping conduction of free carriers. The specification gives examples of dopant concentrations such that at temperatures below about 4K the resistivity is due to hopping conduction of free carriers. In this way, a temperature sensor can be made with a very repeatable relationship between the resistivity and temperature of the germanium temperature sensor.

To summarize the present invention, the temperature sensor is designed for operation at cryogenic temperatures such as less than approximately 4K. The sensor is doped to provide a resisivity that arises from the mechanism of hopping conduction of free carriers.

The Examiner has rejected the pending claims as unpatentable over the teachings of Law, U.S. patent number 3,173,814. This reference is directed to a method of controlled doping in an epitaxial vapor deposition process for making semiconducting junctions such as NPN and PNP junctions. As will be appreciated by those of skill in the art, such junctions can be used for making transitors.

Importantly the Law reference does not teach or suggest the making of a temperature sensor, and certainly not a temperature sensor capable of operating at cryogenic temperatures below about 4K. While the reference suggests that resistivity can be controlled over a wide range, there is no guidance as to what that doping concentration should be to make a temperature sensor. The prior art reference is totally lacking in any teaching or suggestion that dopant concentration should be selected to assure that resistivity arises from the mechanism of hopping conduction of free carriers.

It is submitted that the Examiner is using Applicant's own disclosure in suggesting that the reference meets the limitations. The case law is replete with decisions disallowing such an impermissible hindsight reconstruction based on Applicant's disclosure.

Without Applicant's disclosure, one of ordinary skill in the art, fully cognizant of the Law reference, would not know how to make a temperature sensor for use at cryogenic temperatures, nor would such a person know how to select a dopant concentration to assure that resistivity results from hopping conduction of free carriers.

For the foregoing reasons, it is submitted that the pending claims are not rendered unpatentable by the Law reference. Early favorable action is requested.

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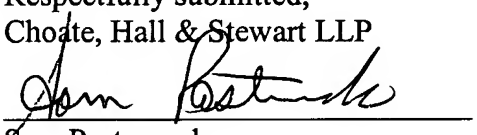
Respectfully submitted,
Choate, Hall & Stewart LLP



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